



Lick Creek Benthic Impairments

First Public Meeting

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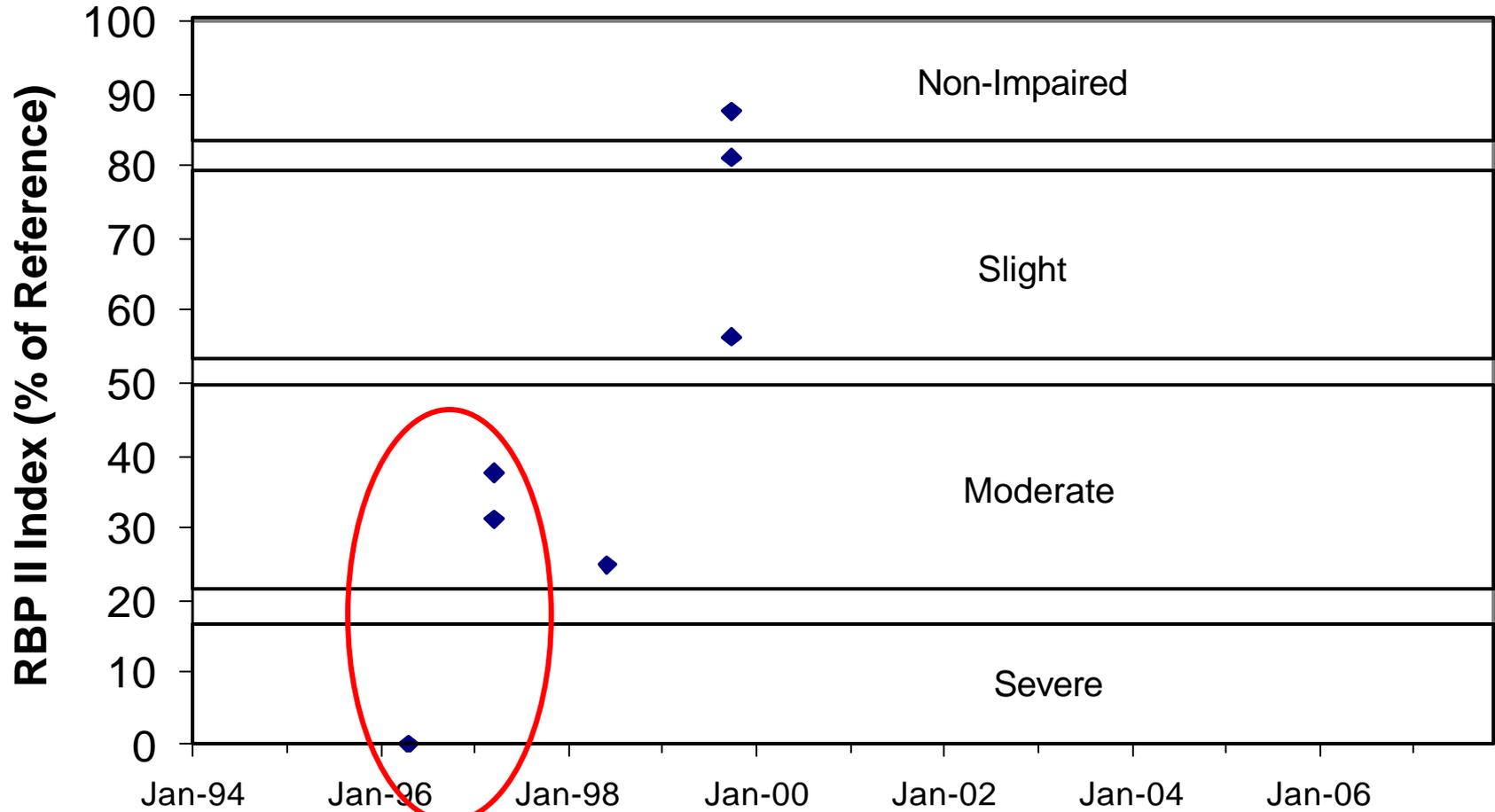
Dante, VA

November 28, 2006

Overview

- Basis for Impairment
- Nature of the Impairment
- Stressor Analysis
 - Eliminated Stressors
 - Possible Stressors
 - Most Probable Stressors
- Next Steps

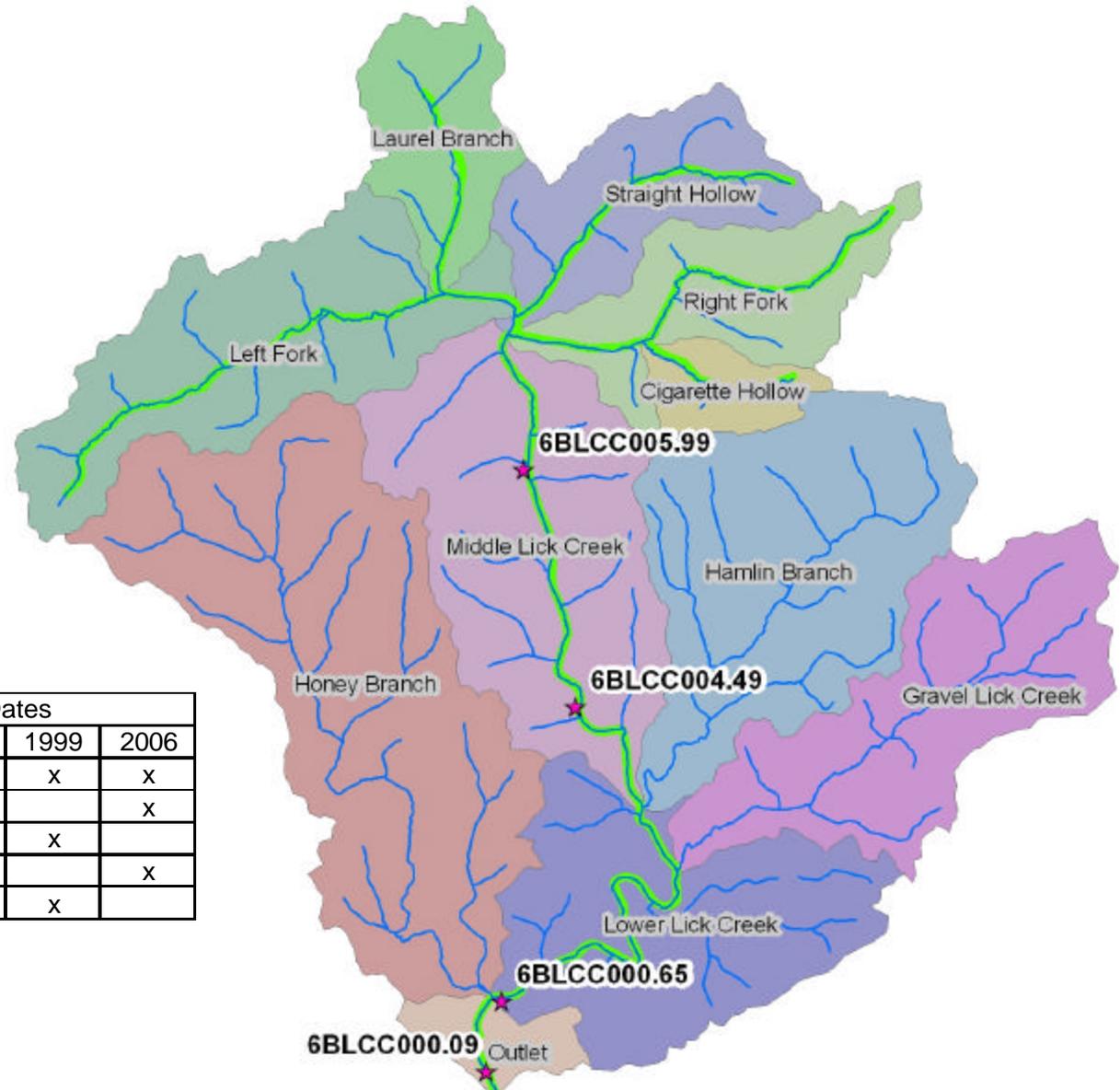
Basis for Impairment



Nature of the Impairment

- Extent of the impairment
- Habitat metrics
- Diversity, pollution tolerance, and abundance

Extent of the Benthic Impairment



DEQ Biological Monitoring Sites	Sampling Dates				
	1996	1997	1998	1999	2006
LCC000.09				x	x
LCC000.65	x	x	x		x
LCC004.49				x	
LCC005.99		x			x
LCC006.44				x	

Habitat Metrics

Habitat Metrics	Station and Collection Date										Ave. Score
	LCC000.09		LCC000.65				LCC004.49	LCC005.99		LCC006.44	
	09/27/99	05/03/06	04/18/96	03/21/97	06/08/98	05/03/06	09/27/99	03/21/97	05/03/06	09/27/99	
Channel Alteration	15	12	15	14	6	14	15	12	15	15	13.3
Bank Stability	9	14	10	6	5	15	9	4	14	9	9.0
Bank Vegetation	17	15	8	9	16	15	16	2	14	16	12.0
Embeddedness	12	16	10	9	5	10	10	17	10	10	10.1
Channel Flow Status	11	13	18	19	17	13	11	19	15	11	15.4
Frequency of Riffles	11	12	18	17	12	17	11	15	15	11	14.5
Riparian Vegetation	15	13	7	1	6	14	12	1	10	12	7.9
Sediment Deposition	9	13	9	13	7	12	7	14	8	7	9.6
Substrate Availability	13	17	17	13	16	18	12	17	17	12	15.3
Velocity/Depth Regime	9	18	16	18	12	14	9	9	10	9	12.1
Total Score (10 Metrics)	121	143	128	119	102	142	112	110	128	112	

 - Indicates Poor to Marginal habitat ratings (< 10)

Diversity, Pollution Tolerance, & Abundance

Taxa	Tolerance Value	Functional Family Group	Habit	Station and Collection Date									
				LCC000.09		LCC000.65			LCC004.49	LCC005.99			
				09/27/99	05/03/06	04/18/96	03/21/97	06/08/98	05/03/06	09/27/99	03/21/97	05/03/06	
Capniidae	1	Shredder							1				
Gomphidae	1	Predator	bur	1								1	
Perlidae	1	Predator	cli		1								
Athericidae	2	Predator	spr							1			
Isonychiidae	2	Filterer	swi		2				1				1
Nemouridae	2	Shredder	spr								2	3	2
Tipulidae	3	Shredder	bur				2	1	2			2	3
Baetidae	4	Collector	swi	13	2			4	6	4		4	7
Elmidae	4	Scraper	cli	26	8	2		2	7	19		9	3
Ephemerellidae	4	Collector	cli	1									
Heptageniidae	4	Scraper	cli			1						5	1
Psephenidae	4	Scraper	cli	2	3				5		1	2	1
Corydalidae	5	Predator	cli	5		3		1		1			
Ancylidae	6	Scraper	cli	3						4		4	4
Chironomidae (A)	6	Collector		6	70	48	5	60	80	3	8	34	32
Empididae	6	Predator	spr		1	1						1	
Hydropsychidae	6	Filterer	cli	38	1		1	8	4	60	5	41	36
Simuliidae	6	Filterer	cli	1	10			15	8				1
Ephydriidae	7	Collector	bur						1				
Lumbriculidae	8	Collector					1	1	5				1
Naididae	8	Collector	bur		1		3		2				2
Coenagrionidae	9	Predator	clm	1									
Tubificidae	10	Collector	bur		2								
No. of Species				11	11	5	5	8	12	7	4	11	13
Total Abundance				97	101	55	12	92	122	92	16	106	94

 - Dominant organisms in each sample.

Benthic Measures Over Time

	04/18/96	03/21/97	06/08/98	09/27/99	May-Aug 2006
No. of Samples	1	2	1	2	3
IBI Score	16.0	26.3	23.5	40.6	33.7
IBI Rating	Impaired	Impaired	Impaired	Impaired	Impaired
RBP II Rating	Svl	Svl	MI	NI	?
No. of Samples					4
VASOS					acceptable
No. of Samples	1	2	1	2	3
No. of Species	5.0	4.5	8.0	9.0	11.3
Total Abundance	55.0	14.0	92.0	94.5	109.7
Total Habitat Score	128.0	114.5	102.0	116.5	137.7

IBI
Non-Impaired
Rating

> 63



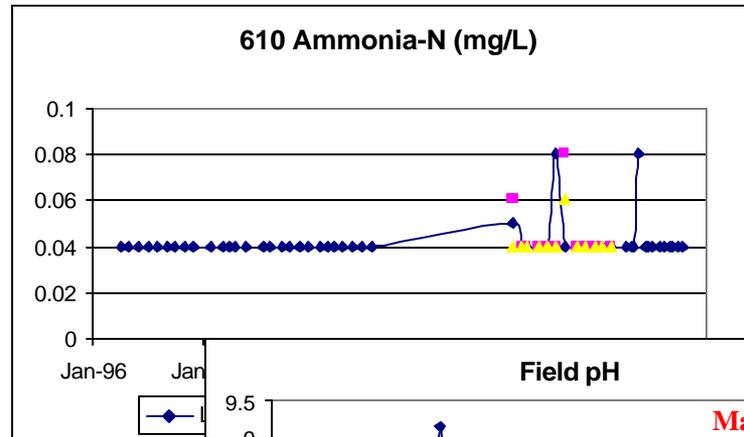
Lick Creek has a benthic impairment!

Stressor Analysis

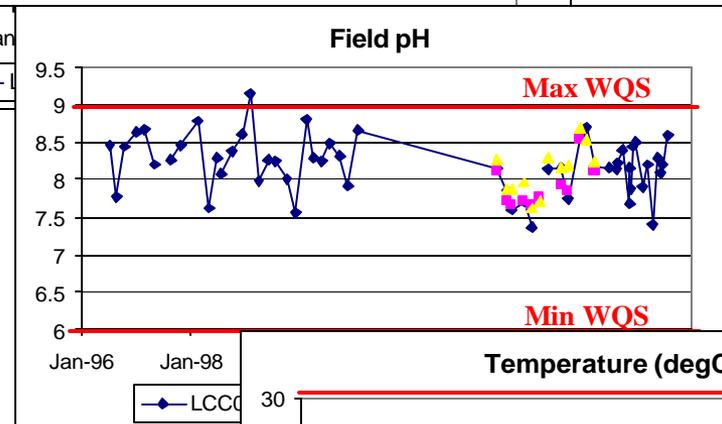
- Cause of impairment not specified
- Review existing data
- Weight-of-evidence approach
- Analyze potential sources

Eliminated Stressors

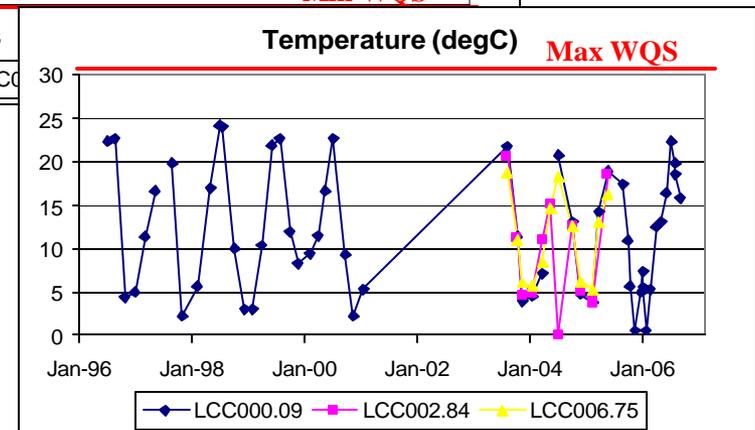
- Ammonia



- pH



- Temperature



Possible Stressors

- Nutrients
- Toxics
- TDS/Conductivity/Sulfates

Nutrient Evidence

- In support of impairment
 - Dominant benthic and fish species associated with nutrient enrichment and/or algae
 - Poor riparian vegetation favoring nutrient inputs from surface runoff
 - Nutrients are a known component of human waste contributed through straight pipes
- Not supportive of impairment
 - Low TN and TP concentrations (0.018 and 0.424 mg/L)
 - [TN] only 5-10% higher than biological reference sites
 - [TP] comparable to biological reference sites

Toxics Evidence

- In support of impairment
 - Lower total number of organisms in the 90's
 - Mining and railroad activities, landfill, etc.
 - Abundance of PCB and PAH compounds, though at low levels
- Not supportive of impairment
 - No exceedences of any human health or aquatic life criteria
 - Currently higher total number of organisms

TDS/Conductivity/Sulfates

- Comparison with reference watersheds
 - TDS – 34% higher, no data since 2001
 - Sulfates – 20% higher, 1996-2006  25%
 - Conductivity – 29% higher, 1996-2006  43%
- WQS (Taste and Odor, not Aquatic Life)
 - TDS – 500 mg/L
 - ◆ DEQ – 1/27 samples; DMLR – 4/34 station averages
 - Sulfates – 250 mg/L
 - ◆ DEQ – 0/36 samples; DMLR – 2/34 station averages
 - Conductivity – 500 μ mhos/cm (screening value)
 - ◆ DEQ – 26/54 samples; DMLR – 15/34 station averages

Most Probable Stressors

- Organic Matter
- Sediment

Organic Matter

- No low DO problems, BOD₅ and COD are low
- Dominant organisms – *hydropsychidae*, *chironomidae*, and *simuliidae* – typical of enriched streams
- Dominant fish – central stonerollers – are algae eaters
- High % of filterer-collectors that require suspended fine organic matter as a food source, and low amounts of scrapers.
- Best set of samples corresponded in improvements of the SC/FC ratio and the % filterer-collectors

	04/18/96	03/21/97	06/08/98	09/27/99	05/03/06
Scraper/Filterer-Collector	0.06	0.04	0.02	0.43	0.16
%Filterer-Collector	87.3%	82.3%	95.7%	66.8%	83.1%
IBI Score	16.0	26.3	23.5	40.6	33.7
RBP II Rating	Svl	Svl	MI	NI	?

Sediment

- Low % Haptobenthos – sprawlers and crawlers – require a clean, coarse substrate
- Many poor habitat metrics related to sediment – bank stability, riparian vegetation, and sediment point deposition
- Large TSS concentrations during runoff

Probable Sources

- Organic Matter
 - straight pipes
 - historic landfill/dumping
- Sediment
 - steep terrain
 - crowded riparian corridors with poor vegetation
 - AML features

Next Steps

- Finalize selection of TMDL stressors
- Reference Watershed Approach
 - Selection of surrogate parameter?
 - Selection of reference watershed
 - Calculation of TMDL target loads
 - Create load reduction/allocation scenarios
 - Write draft report

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